

Patent Claims:

1. Brake-by-wire actuator for actuating the brake system of a motor vehicle, comprising a simulator (2) which can be acted upon by a brake pedal (1), with an output signal of an actuation sensor (3) being sent to an electronic control unit (4) which controls a pressure source in response to the signal of the actuation sensor (3), and with an output of the pressure source that is connected to a distributor device (10) for the brake force and actuates individual wheel brakes (16) of the vehicle, also comprising means for enabling actuation of the brakes by muscular power within a fallback mode,  
c h a r a c t e r i z e d in that a lost travel (a) is provided between a first actuation component (47) such as the brake pedal (1) in particular or a component (36; 21) articulated at the brake pedal (1) and a second actuation component (37) that is connected downstream in the flux of force, in particular an input member (5), in order to uncouple the first actuation component (47) mechanically from the reactions of force of the motor vehicle brake system in a by-wire mode.
2. Brake-by-wire actuator as claimed in claim 1,  
c h a r a c t e r i z e d in that a means (38) is provided in order to automatically reduce the lost travel (a) after a by-wire mode at the commencement of a brake actuation executed by muscular power.
3. Brake-by-wire actuator as claimed in claim 2,  
c h a r a c t e r i z e d in that said means (38) may be actuated by means of an electric, electromagnetic,

hydraulic, or pneumatic actuator (39), which will automatically adopt a closing position for reducing the lost travel (a) in the fallback mode.

4. Brake-by-wire actuator as claimed in claim 3,  
c h a r a c t e r i z e d in that the means (38) is provided as a clutch (20) between the two actuation components (47, 37).
5. Brake-by-wire actuator as claimed in claim 4,  
c h a r a c t e r i z e d in that the means (38) comprises a block-shaped body (40) which bridges the lost travel (a) between the actuation components (47, 37) in a form-fit manner.
6. Brake-by-wire actuator as claimed in claim 4,  
c h a r a c t e r i z e d in that the actuator (39) includes a spring (41) for the elastic preload of the block-shaped body (40) and a solenoid (42) for returning or keeping back the block-shaped body (40) in the opening position.
7. Brake-by-wire actuator as claimed in claim 1,  
c h a r a c t e r i z e d in that the pressure source comprises a hydraulic booster with at least one hydraulic pump (53) which is actuatable by electric signals in the by-wire mode, and in that the actuation in the fallback mode is carried out hydraulically by way of a master brake cylinder (11).
8. Brake-by-wire actuator as claimed in claim 7,  
c h a r a c t e r i z e d in that the pump (53) feeds a high-pressure accumulator (54).

9. Brake-by-wire actuator as claimed in claim 1,  
c h a r a c t e r i z e d in that the pressure source  
comprises a pneumatic booster (6) which is actuatable by  
electric signals in the by-wire mode and mechanically by  
way of the actuation components (47, 37) in the fallback  
mode.
10. Brake-by-wire actuator as claimed in claim 9,  
c h a r a c t e r i z e d in that the pressure source  
includes a pneumatic booster (6) and additionally a  
hydraulic pump (53) being actuated, for example, in the  
event of a defect of the pneumatic booster (6) or when  
boosting is not sufficient.
11. Brake-by-wire actuator as claimed in claim 9,  
c h a r a c t e r i z e d in that the pressure source  
includes an electromotively driven master brake cylinder.
12. Brake-by-wire actuator as claimed in any one of claims 7  
to 11,  
c h a r a c t e r i z e d in that there is provision of  
one or more sensors, in particular a travel sensor (17), a  
pneumatic pressure sensor or differential pressure sensor  
in the pneumatic booster (6), and/or a hydraulic pressure  
sensor (18) in a brake circuit detecting deviations from  
nominal values, and in that the electronic unit (4) on  
account of detected sufficient deviations detects a  
malfunction such as the inclusion of air or a circuit  
failure in the brake system and initiates appropriate  
safety processes such as the fallback mode in particular.

13. Brake-by-wire actuator as claimed in claim 12,  
c h a r a c t e r i z e d in that the travel sensor (17)  
and/or pressure sensor/differential pressure sensor  
detects a point of maximum boosting of the booster (6),  
and in that the hydraulic pump (53) is started by way of  
the electronic unit (4).
14. Brake-by-wire actuator as claimed in claim 1,  
c h a r a c t e r i z e d in that the simulator (2)  
includes a motor (19) or a spring (28) used to generate  
reaction forces.
15. Brake-by-wire actuator as claimed in claim 4,  
c h a r a c t e r i z e d in that the position of the  
point of application of the brake pedal (1) in relation  
to the subsequent actuation component (5) is adjustable.
16. Brake-by-wire actuator as claimed in claim 15,  
c h a r a c t e r i z e d in that the brake pedal (1) is  
coupled to a clutch shaft (21) pivotally mounted in its  
longitudinal direction which is longitudinally  
displaceable relative to the input member (5) in  
dependence on its rotary position relative to the input  
member (5) or is in engagement with the input member (5)  
in an axial direction.
17. Brake-by-wire actuator as claimed in claim 16,  
c h a r a c t e r i z e d in that both the clutch shaft  
(21) and the input member (5) include projections (23, 30)  
serially arranged in their longitudinal direction in a row  
(22, 31), and in a first rotary position of the clutch  
shaft (21) in relation to the input member (5), the

projections (23, 30) of the clutch shaft (21) and the input member (5) are disengaged, while in a second rotary position at least one projection (30) of the clutch shaft (21) is engaged with a projection (23) of the input member (5).

18. Brake-by-wire actuator as claimed in claim 17,  
c h a r a c t e r i z e d in that several rows (22, 31) of projections (23, 30) are provided at a predetermined angular distance over a periphery of the input member (5) and the clutch shaft (21).
19. Brake-by-wire actuator as claimed in claim 17,  
c h a r a c t e r i z e d in that the clutch shaft (21) is equipped with a longitudinal bore (25) that is open towards the input member (5), with one end of the input member (5) projecting into said bore, and in that peripheral surfaces (24, 35) of the end of the input member (5) and of the longitudinal bore (25) in the clutch shaft (21) carry the projections (23, 30).
20. Brake-by-wire actuator as claimed in claim 16,  
c h a r a c t e r i z e d in that the clutch (20) includes a spring (28) whose first end is supported on a housing (32) of the clutch (20) and whose second end is supported on a transmission member (26), with said transmission member (26) being connectable to the clutch shaft (21) pivotally mounted in its longitudinal direction, with said clutch shaft (21) being longitudinally displaceable in relation to the transmission member (26) in dependence on its rotary position with respect to the transmission member (26) or

being in engagement with the transmission member (26) in an axial direction by way of projections (33, 34).

21. Brake-by-wire actuator as claimed in claim 20,  
c h a r a c t e r i z e d in that the clutch shaft (21) is in engagement with the input member (5) and disengaged from the transmission member (26) in at least one first rotary position and is disengaged from the input member (5) and in engagement with the transmission member (26) in at least one second rotary position.